

Heat Stress Consequences and Mechanics

Elanco Dairy Business
Tom Bailey, DVM, MS, ACT



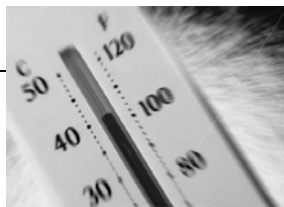
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Heat Stress

- Check the records
- Ask the cows, always ask the cows!
- Walk the herd – look and observe
 - What are the cows telling you?
- Consequences of heat stress
- Mechanics of heat stress
- Economics of heat stress



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At what temperature do cows start to experience the effects of heat stress???

Photo from hxp37703 www.fotosearch.com



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Temperature Humidity Index (THI)

THI > 72 = Heat Stress

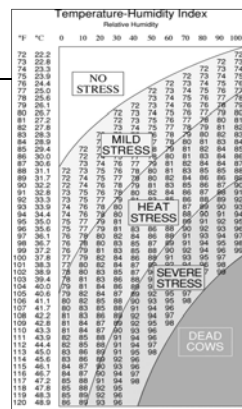
Environmental Modification To Reduce Heat Stress Dennis V. Armstrong, Western Large Herd Management Conference 1993



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Temperature Humidity Index (THI)

Easy way to measure and evaluate heat stress



DBM0688 Dr. Frank Wiersma (1993). Department of Agricultural Engineering, University of Arizona.

Examples of Temperature Humidity Indexes (THI)

°F	Humidity %	THI
80	45	73
90	45	80
90	75	86

Environmental Modification To Reduce Heat Stress Dennis V. Armstrong, Western Large Herd Management Conference 1993

DBM0688 THI for Dairy Cows, F. Wiersma 1990.



Changes in maintenance requirements, dry matter intake, milk production and water intake with increasing environmental temperatures¹

Temperature ° F	Maintenance, % of E	DMI for maint. + 60 lb milk		Water intake gallons/day
		Needed (lb/day)	Expected	
- 4	151	47	45	14
32	110	41	41	17
68	100	40	40	18
86	111	42	37	21
95	120	43	37	32
104	132	45	23	28

James G Linn, U of Minnesota, Dairy Update Issue 125, February 1997,
Nutritional Management of Lactating Dairy Cows During Periods of Heat Stress

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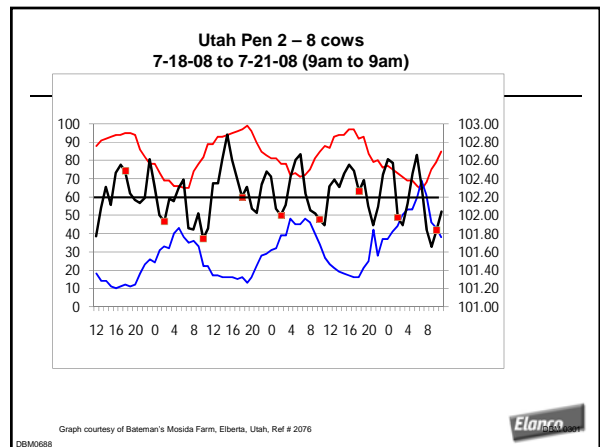
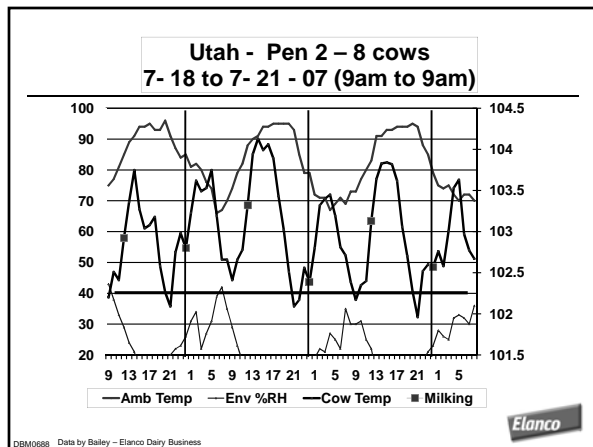
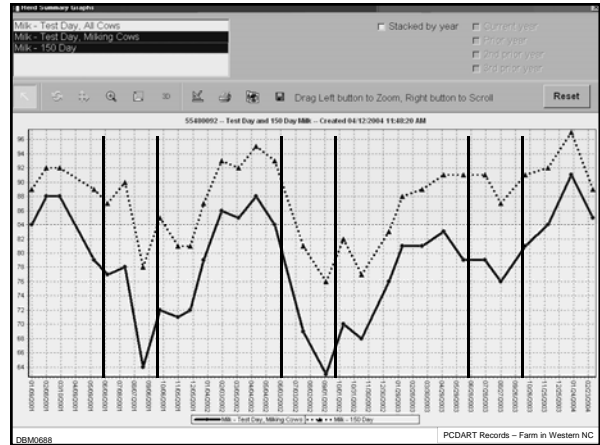
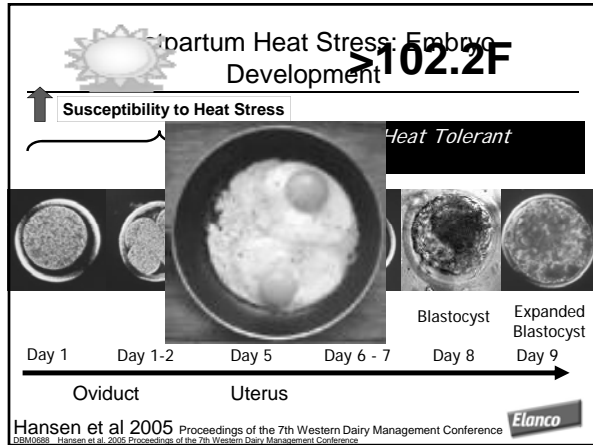


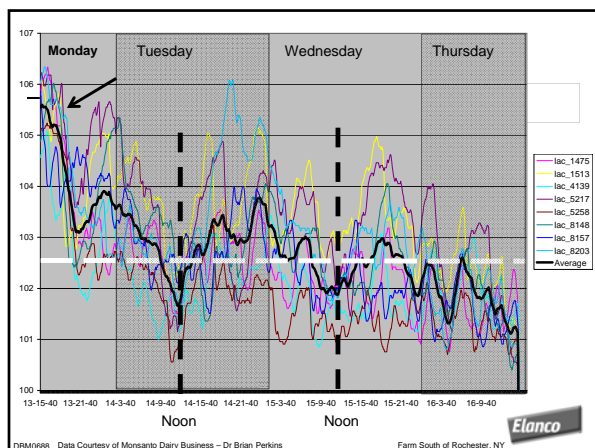
126 9-Month Pregnancy Rate Summary by Date (Ex C)

PCDART Report Ref: 09-30-03 YMR: 60 Pgch: 45

Last Date of 21 days	Heats			Pregnancies		
	#Eligible	#Observed	%Obs	#Eligible	#Reported	Rate
01-21-2003	202	141	70	175	41	23
02-11-2003	199	142	71	176	49	28
03-04-2003	189	133	70	167	39	23
03-25-2003	180	129	72	150	37	25
04-15-2003	170	106	62	138	35	25
05-06-2003	165	110	67	130	21	16
05-27-2003	170	116	68	140	27	19
06-17-2003	167	113	68	135	21	16
07-08-2003	180	113	63	140	15	11
07-29-2003	192	125	65	158	26	16
08-19-2003	204	146	72	0	0	0
09-09-2003	262	180	69	0	0	0
09-30-2003	323	246	76	0	0	0
total	2603	1880	69	1509	311	21

DBM0688 PCDART Records - Farm in Western NC





The MOST Hostile Environment on the Farm



DBM0688 Video by Bailey Utah Farm – Elanco Dairy Business

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DBM0688 Video by Bailey Utah Farm – Elanco Dairy Business

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DBM0688 Video by Bailey Utah Farm – Elanco Dairy Business

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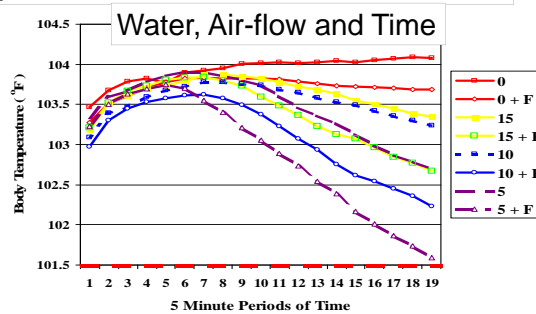


DBM0688 Video by Bailey – Michigan Farm – Elanco Dairy Business

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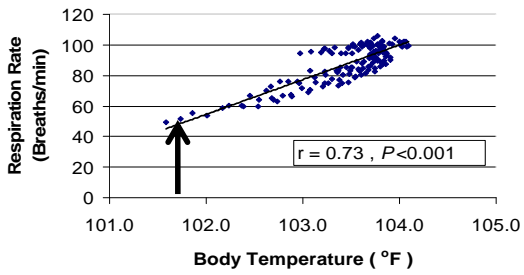
Effects of Cooling Treatments on Body Temperature over 95 Minutes

Brink, M.J. et al. 2003. Effectiveness of Cow Cooling Strategies Under Different Environmental Conditions. Proceedings from the Western Dairy Management Conference



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Relationship of Respiration Rate and Body Temperature of Cattle



DBM0688 Brouck, et al. Arizona Dairy Producer Conference, Univ. of Arizona, 2002.

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DBM0688 Video by Bailey - Florida Farm - Elanco Dairy Business

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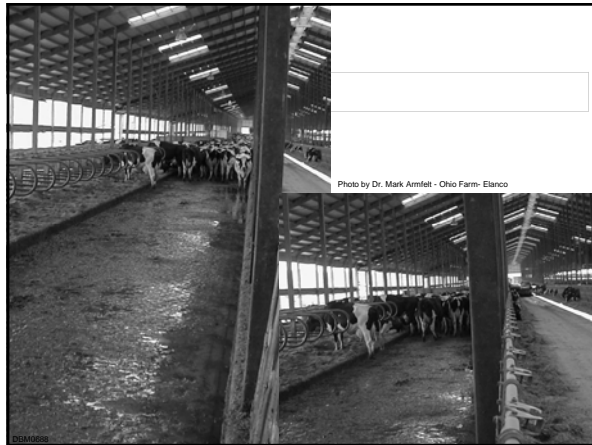


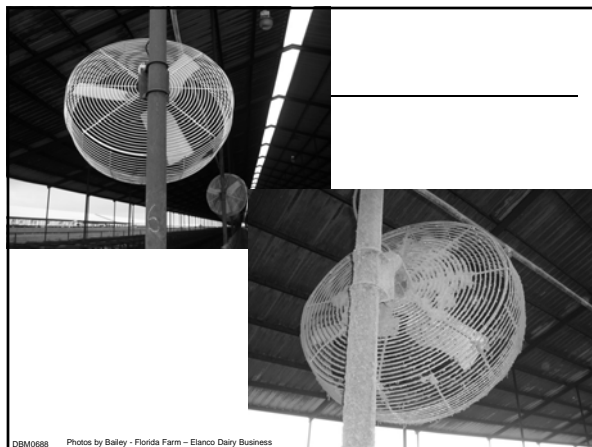
Photo by Dr. Mark Amfelt - Ohio Farm - Elanco

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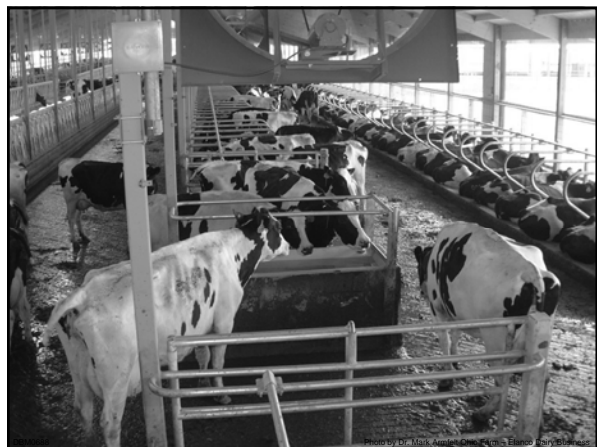


DBM0688 Photo by Bailey - Florida Farm - Elanco Dairy Business

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DBM0688 Photos by Bailey - Florida Farm - Elanco Dairy Business



Photos by Dr. Mark Amfelt - Ohio Farm - Elanco Dairy Business



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Photo by Dr. Mark Arnold Ohio Farm - Elanco Dairy Business



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Photo by Dr. Mark Arnold Ohio Farm - Elanco Dairy Business

68F = 80 secs/12 min
83F to 84F = 80 secs/6 min
½ g nozzles

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DDM0688 Photo by Bailey - Va Farm - Elanco Dairy Business

68F
83F

Control box

Photo by Bailey - Va Farm - Elanco Dairy Business



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Photos by Bailey - Va Farm - Elanco Dairy Business



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Photo by Bailey - Va Farm - Elanco Dairy Business



DBM0688 Photo by Bailey - Florida Farm - Elanco Dairy Business

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500 Cow Herd Water for 150 Days

- Water on 90 m/d
- 15 gals/cow/d (1/2 g) (includes holding pen)
- 7500 gals/d
- 30% evaporates
- 5000 gals/d
- 750,000 for 150 d
- \$0.02 for disposal
- \$15,000
- 5 lb milk saved
- 2500 lb/d
- 150 d X 2500 = 3750 CWT
- 3750 X \$13.00 = \$48,750

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500 Cow Dairy

- 2 freestall barns 250 ft long
- 2 Control Boxes @ \$475.00 = \$950.00
- 8 solenoids (1 in) @ \$40.00 = \$320.00
- 2 pressure reducers @ \$80 = \$160.00
- 1000 ft of 1" PVC pipe @ \$1.50/ft = \$1500
- 1000 ft angle iron @ \$2.00 = \$2000
- Nozzles @ \$4.75 X 125 = \$600.00
- Drill bits, tap, glue, unions, = \$200.00
- Labor ?

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Holding Pen

- Control Box = \$475.00
- 1 Solenoid (1.5 in) = \$75.00
- Pressure reducer 1.5 in = \$100.00
- Pipe 1.5 in @ \$1.75 X 150 ft. = \$265.00
- 3 drop nozzles @ \$48.00 = \$144.00
- or
- 5 lawn sprinklers @ \$20.00 = \$100.00
- Misc = \$150.00
- Labor ???

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Heat Stress and Cows

- DMI reduction
- Loss of HCO₃ with rumen acidosis
- Reproductive implications
- Premature replacement
- Lower production
- Milk fat depression
- Laminitis/lameness
- Lowered immune system
- Mastitis
- Transition disease (RP, DA, etc.)
- Lower body condition score (BCS)

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Cow Comfort Thank You



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Photo by Bailey - SE Minnesota Farm - Elanco Dairy Business

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